

TABLE 3.—Mean free-air barometric pressures (*P*), in mb, and equivalent potential temperatures (*Θ*_e), in °A. obtained by airplanes during the year 1937

Stations	Altitude (meters) m. s. l.																			
	Surface				500		1,000		1,500		2,000		2,500		3,000		4,000		5,000	
	Num- ber of obser- vations	P	Θ _e	P	Θ _e	P	Θ _e	P	Θ _e	P	Θ _e	P	Θ _e	P	Θ _e	P	Θ _e	P	Θ _e	
Barksdale Field, La.	326	1,012	314	959	315	904	316	852	318	802	318	755	318	710	318	628	320	-----	-----	
Boston, Mass.	312	1,016	296	957	300	901	301	847	304	796	305	748	307	703	308	618	312	-----	-----	
Cheyenne, Wyo.	351	811	308	-----	-----	-----	-----	-----	-----	798	811	750	314	706	315	622	316	547	316	
Coco Solo, Canal Zone.	299	1,009	349	953	348	901	345	849	343	801	341	754	338	711	335	629	334	557	334	
El Paso, Tex.	364	882	315	-----	-----	-----	-----	850	321	801	322	754	322	710	322	623	322	554	324	
Fargo, N. Dak.	356	983	288	956	294	899	298	845	300	794	303	746	304	700	306	615	308	540	311	
Lakehurst, N. J.	283	1,013	297	953	301	902	302	848	304	798	305	750	307	704	308	620	310	-----	-----	
Mitchel Field, N. Y.	297	1,015	298	959	303	902	305	848	307	798	309	750	310	704	311	621	313	-----	-----	
Nashville, Tenn.	356	997	308	960	311	904	313	851	314	801	314	753	314	708	315	625	316	551	318	
Oakland, Calif.	364	1,016	302	953	309	903	312	850	312	801	312	753	312	709	313	625	315	551	317	
Oklahoma City, Okla.	356	970	310	958	313	903	316	850	318	801	319	754	319	709	319	626	319	552	319	
Pearl Harbor, Territory of Hawaii.	362	1,015	330	959	332	905	331	853	329	804	326	757	324	714	324	632	324	558	326	
St. Thomas, Virgin Islands.	352	1,016	346	961	346	907	342	855	337	806	334	759	330	715	329	634	328	560	329	
Salt Lake City, Utah.	360	871	307	-----	-----	-----	-----	849	314	800	315	752	315	707	316	624	317	549	319	
San Diego, Calif.	343	1,014	309	958	314	902	317	850	317	801	317	754	318	709	319	627	321	554	322	
Sault Ste. Marie, Mich.	351	989	289	956	294	898	296	844	298	792	300	744	302	698	304	613	307	538	309	
Spokane, Wash.	362	946	298	-----	-----	-----	-----	848	306	797	307	749	308	704	308	619	309	544	311	
Washington, D. C.	318	1,018	302	960	305	903	306	850	307	799	309	752	310	706	311	622	313	547	316	
Wright Field, Ohio.	299	989	298	958	302	902	305	849	306	798	307	750	308	705	310	621	312	546	315	

RIVERS AND FLOODS

[River and Flood Division, MERRILL BERNARD in Charge]

By BENNETT SWENSON

The outstanding flood during December 1937 occurred in the Sacramento River. A report of this flood appears as a separate article in this REVIEW (pp. 441).

Moderate floods in the northern portion of the Ohio Basin resulted generally from moderately heavy rains from December 15-18, falling on a snow covering, and at a time when the rivers were largely frozen. The run-off from rain and melted snow was heavy, principally in the Allegheny and Monongahela Basins and in the northern tributaries of the Ohio from the Beaver to the Muskingum River. A breaking up of the ice resulted, but no serious damage occurred.

The snow cover was heaviest over the Allegheny Basin, with depths of 7 to 9 inches in the northern portion. In the section between the Clarion and Kiskiminetas Rivers the snow depth averaged from 3 to 6 inches. Over the Monongahela Basin there was from 1 to 2 inches of snow on the ground, generally, and in the mountains about 6 inches.

Flood stages were not reached except in the lower 60 miles of the Allegheny, in the Ohio between Pittsburgh, Pa., and Wheeling, W. Va., and at the mouth of the Muskingum.

The river at Pittsburgh reached a crest of 27.5 feet at 5 a. m. of the 19th and then began to fall slowly. The damage was slight, estimated at about \$500 along the Allegheny River and \$2,000 in the Ohio between Pittsburgh and Wheeling.

A moderate rise occurred in the Muskingum River, and the crest in that stream reached the mouth in time to meet the Ohio crest. This resulted in a stage of 35.1 feet at Marietta, Ohio, on December 20, 0.1 foot above flood stage.

Moderate flooding occurred in the White and Wabash Rivers but no appreciable damage resulted.

Light to moderate floods during the month were reported in portions of the Red Basin, and the upper St. Francis and Trinity Rivers. Damages of consequence were esti-

mated as follows: Ouachita River, \$14,000, and Trinity River, \$5,000.

A moderately severe flood occurred during the latter part of the month in the middle and northern portions of the Willamette Basin in Oregon. The flood resulted from heavy precipitation during the period December 26-30, following above-normal precipitation in November and early December. Three inches of rainfall occurred during a 24-hour period at a number of stations; and Falls City, Oreg., on the Luckiamute River, reported 5.50 inches on the 27th, and 4.48 inches on the 29th, with a total of 14.12 inches in 4 days. The greatest 24-hour amount at Portland, Oreg., was 5.01 inches.

Considerably more damage was caused by the high water and heavy rains than usually occurs when the Willamette River stages are much higher. This may be attributed to the high stages reached in the tributaries that are normally nothing more than small creeks; also, to the heavy concentration of precipitation.

The streams that probably were overloaded the most were the Luckiamute, Marys, Molalla, Pudding, Tualatin, and Yamhill Rivers. Of these streams the Molalla and Tualatin contributed much more water than usual. At some points in the Tualatin Valley the water was higher than the December 1933 flood, which was the highest in many years in those rivers.

Losses from the flood were confined mostly to the destruction of bridges and damage to highways by slides and washouts, loss of fences and the deposition of debris on tillable lands, and the suspension of business and loss of wages. The total loss is estimated at \$127,800.

Unusually low stages prevailed during December in the Missouri and Mississippi Rivers. At St. Charles, Mo., on the Missouri, and at Grafton and Alton, Ill., and St. Louis, Mo., on the Mississippi, new all-time low stages were established. The lowest stage reached at St. Louis was 5.5 feet below zero on December 12 and 13. Ice conditions were largely the cause of the low stages.

Table of flood stages during December 1937

[All dates in December unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE					
Santee: Rimini, S. C.-----	Feet 12	{ 18 30	19 (1)	Feet 12.2 12.8	19 31
MISSISSIPPI SYSTEM					
Ohio Basin					
Allegheny:					
Lock No. 8, near Mosgrove, Pa.-----	24	18	19	26.2	18
Lock No. 5, Schenley, Pa.-----	24	18	19	29.7	18
Lock No. 4, Natrona, Pa.-----	24	18	19	27.4	18
Lock No. 3, Acmetonia, Pa.-----	25	18	19	28.0	18, 19
Walhonding: Walhonding, Ohio-----	8	18	18	8.0	18
Muskingum: Lock No. 1, Marietta, Ohio					
(lower gage)-----	35	20	20	35.1	20
Scioto: La Rue, Ohio-----	11	18	18	12.8	18
West Fork of White:					
Anderson, Ind.-----	8	{Nov. 29 17	1	8.3	Nov. 30
Noblesville, Ind.-----	14	18	19	14.1	18, 19
Elliston, Ind.-----	18	18	25	26.0	21, 22
Edwardsport, Ind.-----	12	18	27	18.7	23, 24
East Fork of White: Seymour, Ind.-----	14	18	21	16.1	19, 20
White:					
Petersburg, Ind.-----	16	20	28	20.9	26
Hazleton, Ind.-----	16	20	29	21.0	27
Wabash:					
Lafayette, Ind.-----	11	18	20	12.5	19
Covington, Ind.-----	16	20	21	18.7	20
Ohio:					
Pittsburgh, Pa.-----	25	18	19	27.5	19
Dam No. 7, Midland, Pa.-----	30	18	20	36.0	19
Dam No. 12, near Wheeling, W. Va.-----	36	19	20	37.4	19
Arkansas Basin					
Petit Jean: Danville, Ark.-----	20	18	20	21.1	19

(1) Continued at end of month.

Table of flood stages during December, 1937—Continued

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
MISSISSIPPI SYSTEM					
Red Basin					
Ouachita: Camden, Ark.....	Feet 26	28	Jan. 5	Feet 30.1	Jan. 1
Sulphur:					
Ringo Crossing, Tex.....	20	17	20	24.4	18
Naples, Tex.....	22	22	(1)	27.7	31
Cypress: Jefferson, Tex.....	18	30	(1)	23.3	31
Lower Mississippi Basin					
Big Lake Outlet: Manila, Ark.....	10	30	(1)	10.3	31
St. Francis: Fisk, Mo.....	20	19	21	22.1	20
WEST GULF OF MEXICO DRAINAGE					
Trinity: Trinidad, Tex.....	28	29	(1)	29.7	30
PACIFIC SLOPE DRAINAGE					
Sacramento Basin					
Stony Creek: St. John, Calif.....	12	11	12	12.0	11, 12
North Fork of Yuba: Colgate, Calif.....	14	10	11	22.0	10
Feather: Oroville, Calif.....	25	11	11	26.3	11
Sacramento:					
Kennett, Calif.....	25	11	11	29.0	11
Red Bluff, Calif.....	23	11	12	32.0	11
Hamilton City, Calif.....	22	11	12	22.8	11
Knights Landing, Calif.....	30	12	17	32.6	14
Columbia Basin					
Santiam: Jefferson, Oreg.....	10	29	31	13.5	30
South Yamhill: Willamina, Oreg.....	8	27	30	14.0	27
Willamette:					
Harrisburg, Oreg.....	10	12	13	11.4	12
Salem, Oreg.....	20	30	31	21.5	31
Oregon City, Oreg.....	12	29	(1)	16.3	31
Portland, Oreg.....	18	30	31	19.0	30
Columbia: Vancouver, Wash.....	15	30	31	15.8	31

(1) Continued at end of month.

WEATHER ON THE ATLANTIC AND PACIFIC OCEANS

[The Marine Division, I. R. TANNEHILL in Charge]

NORTH ATLANTIC OCEAN, DECEMBER 1937

By H. C. HUNTER

Atmospheric pressure.—The pressure situation during December was mainly like that of November, the northern region having decidedly high pressure compared with normal, while pressure below normal was the rule in the Bermuda-West Indies region. The notable change was in the southeastern areas, where slightly above normal December pressure succeeded the considerably below normal November pressure. At Horta the November average, a quarter inch under normal, gave way to a December average 0.04 inch above normal; the mean of the latter month (30.18 inches) being the highest among those shown in table 1.

Over the southern region and the waters adjacent to northwestern Europe pressure was almost everywhere higher during the second half of the month than during the first half. A different situation is noted for the Labrador-eastern Canada section, where the first 12 days had mainly high pressure and the period from 13th to 23d, low pressure.

The extremes of pressure in the vessel reports at hand are 30.67 and 28.69 inches. The higher mark was noted on the American steamship *Scanstates*, at noon of the 28th, near 58° N., 12° W. A slightly higher reading was made next day at the island station of Lerwick, as shown in table 1. The lower mark was recorded on the American steamship *Scarpenn*, early on the 21st, near 53° N., 37½° W.

TABLE 1.—Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, December 1937

Stations	Average pressure	Departure	Highest	Date	Lowest	Date
	Inches	Inch	Inches		Inches	
Julianehaab, Greenland	29.73	+0.25	30.56	7	29.02	22
Reykjavik, Iceland	29.70	+0.23	30.39	23	28.85	22
Lerwick, Shetland Islands	29.90	+0.18	30.71	29	29.26	5, 14
Valencia, Ireland	29.90	-0.04	30.62	27	29.09	13
Lisbon, Portugal	30.13	+0.02	30.45	26	29.68	8
Madeira	30.10	+0.01	30.33	5	29.74	8
Horta, Azores	30.18	+0.04	30.60	12	29.60	18
Belle Isle, Newfoundland	29.95	+0.21	30.52	3	29.28	22
Halifax, Nova Scotia	30.01	+0.06	30.58	23	29.56	14
Nantucket	30.06	+0.01	30.58	27	29.14	7
Hatteras	30.15	+0.02	30.52	27	29.50	6
Bermuda	30.06	-0.06	30.36	28	29.42	4
Turks Island	30.00	-0.03	30.12	27	29.86	9
Key West	30.08	0.00	30.22	27	29.77	6
New Orleans	30.17	+0.04	30.45	2	29.71	17

NOTE.—All data based on a. m. observations only, with departures compiled from best available normals related to time of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

Cyclones and gales.—A considerable number of gales occurred, but reports available show none of forces 11 or 12. The absence of gales of these intensities is unusual in December. Several whole gales (force 10) were recorded, and it is noteworthy that more than two-thirds of these were met during the final 10 days of the month. Storm activity was at a minimum from the 7th to 12th.

A notable low of early December was centered the forenoon of the 2d about midway between Bermuda and